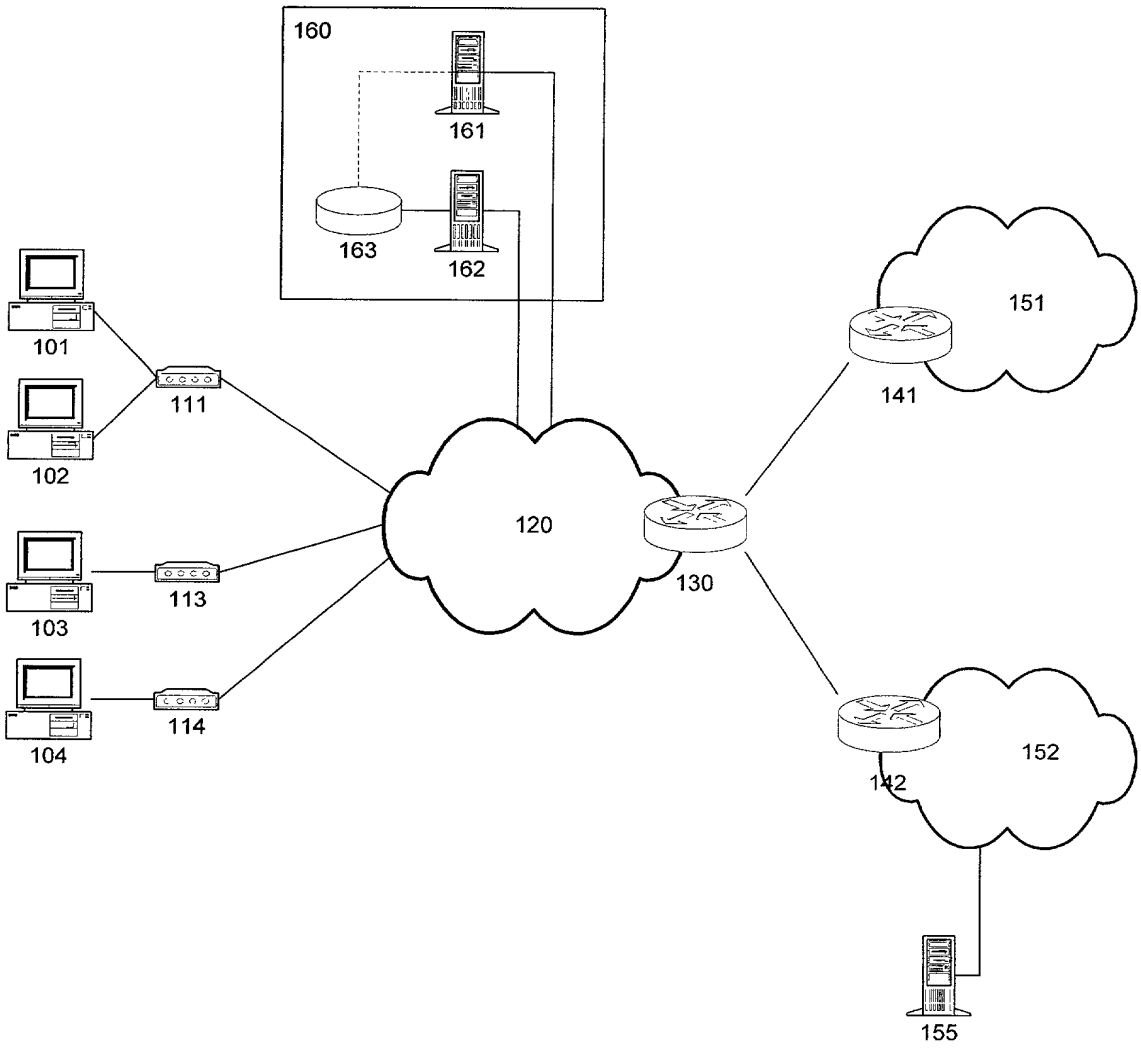
160
161
163
162
101
102
111
103
113
104
114
120
130
141
151
142
152
155

FIG. 1

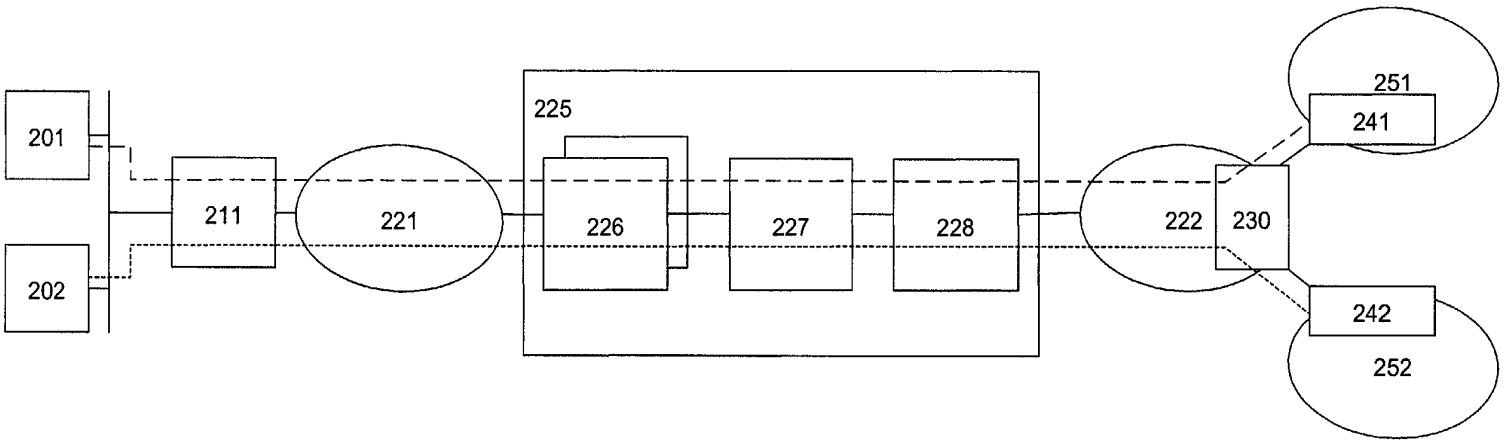
201
202
211
221
225
226
227
228
222
230
251
241
242
252

FIG. 2A

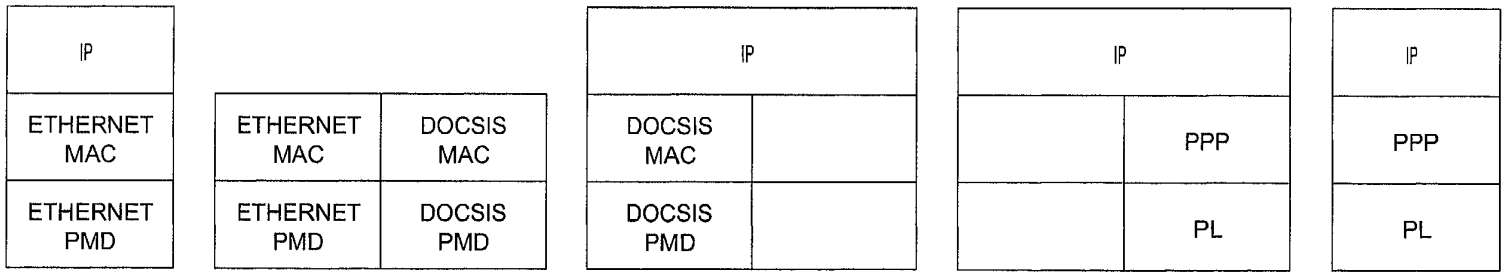
IP
ETHERNET MAC
ETHERNET PMD
PC 201
ETHERNET MAC
DOCSIS MAC
ETHERNET PMD
DOCSIS PMD
CABLE MODEM 211
IP
DOCSIS MAC
DOCSIS PMD
CMTS 226
IP
PPP
PL
ROUTER 230
IP
PPP
PL
ROUTER 241

FIG. 2B

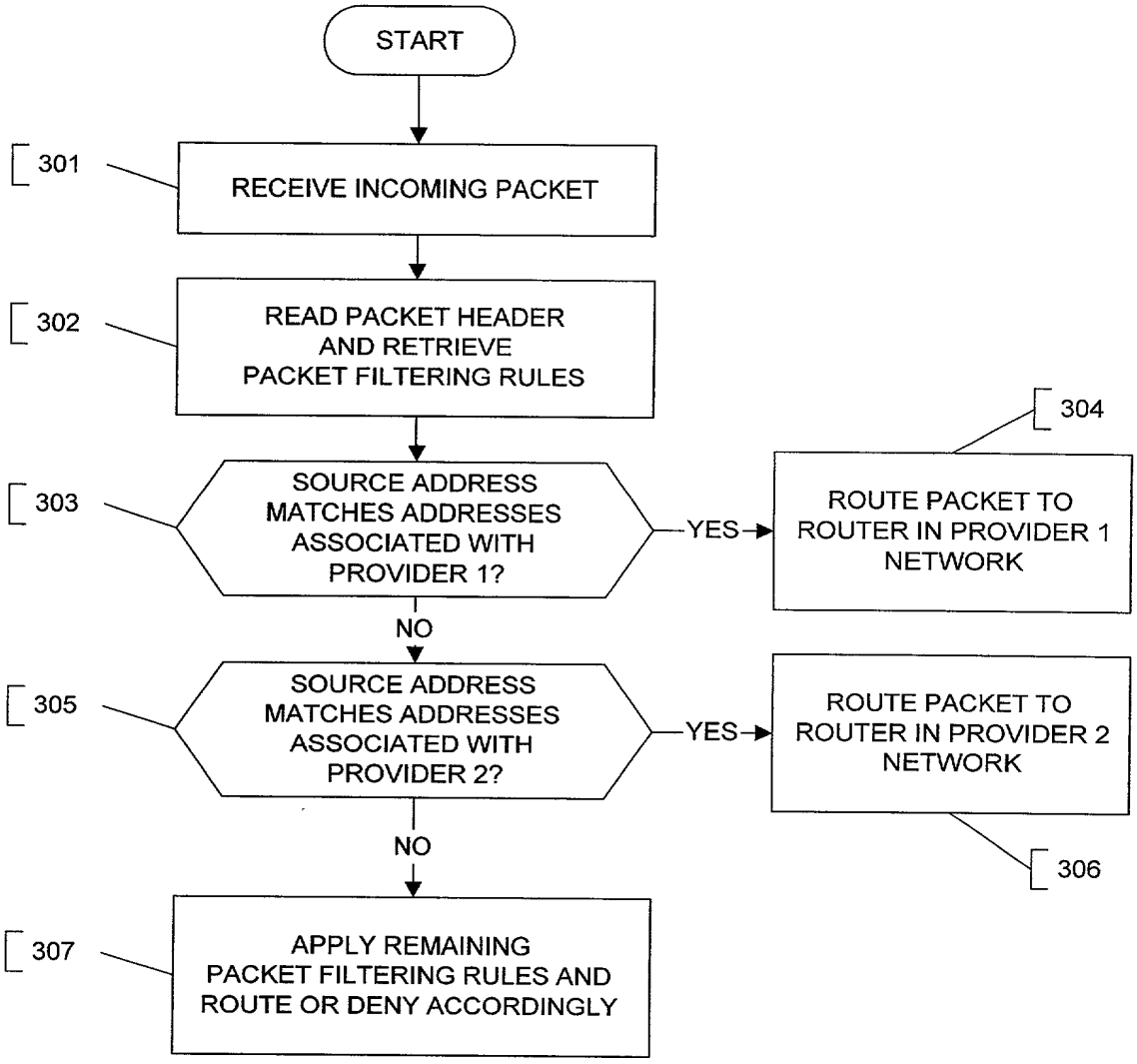
START
301
RECEIVE INCOMING PACKET
302
READ PACKET HEADER AND RETRIEVE PACKET FILTERING RULES
303
SOURCE ADDRESS MATCHES ADDRESSES ASSOCIATED WITH PROVIDER 1?
YES
304
ROUTE PACKET TO ROUTER IN PROVIDER 1 NETWORK
NO
305
SOURCE ADDRESS MATCHES ADDRESSES ASSOCIATED WITH PROVIDER 2?
YES
ROUTE PACKET TO ROUTER IN PROVIDER 2 NETWORK
306
NO
307
APPLY REMAINING PACKET FILTERING RULES AND ROUTE OR DENY ACCORDINGLY

FIG. 3

```
401  interface cable x/y
402  ...
403  ip policy route-map source_route
404  ...
405  !

406  route-map source_route
407  match ip address isp1_subs
408  set ip next-hop isp1_next-hop_address
409  match ip address isp2_subs
410  set ip next-hop isp2_next-hop_address
411  ...
412  access-list isp1_subs permit isp1_prefix1
isp1_prefix1_wildcard any any
413  access-list isp1_subs permit isp1_prefix2
isp1_prefix2_wildcard any any
414  ...
```

FIG. 4

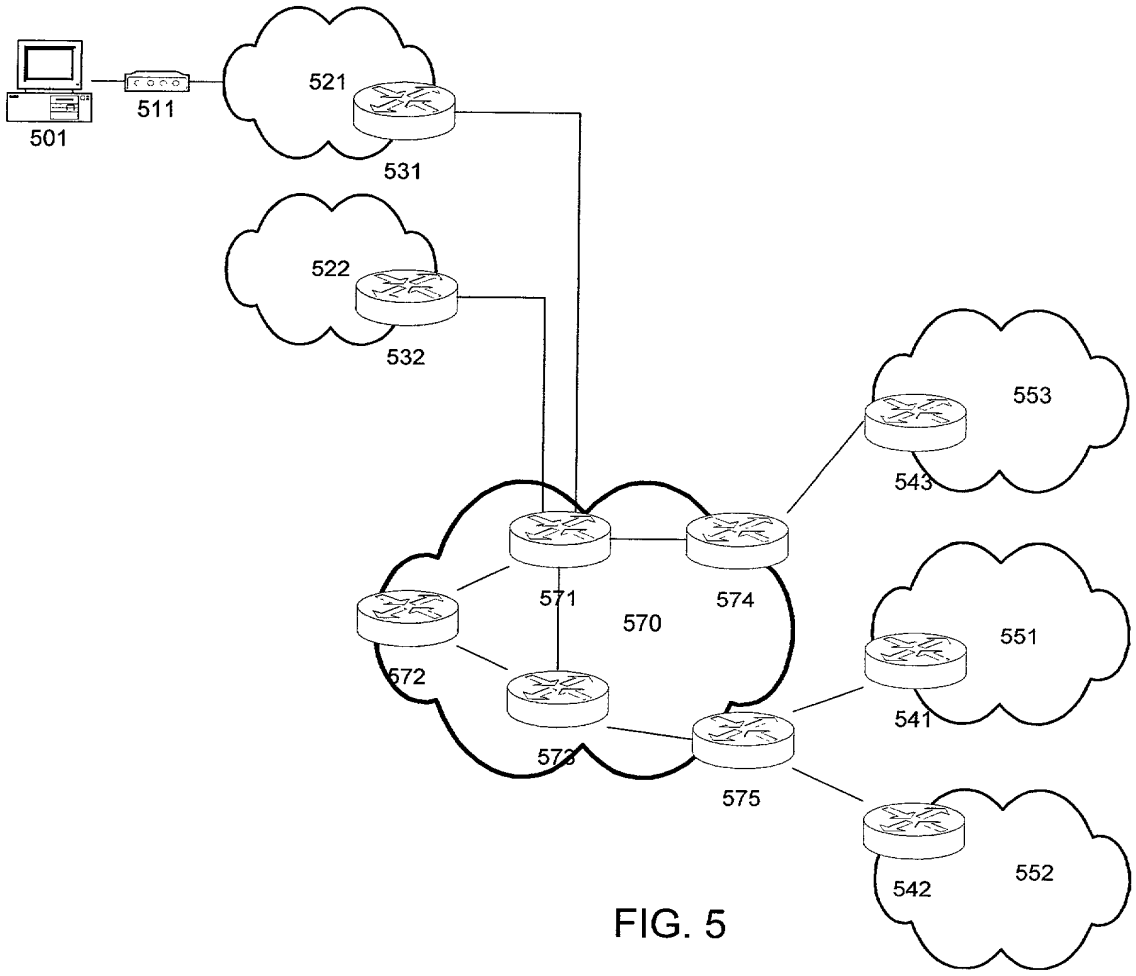
501
511
521
531
522
532
553
543
571
570
574
572
573
551
541
575
552
542

FIG. 5

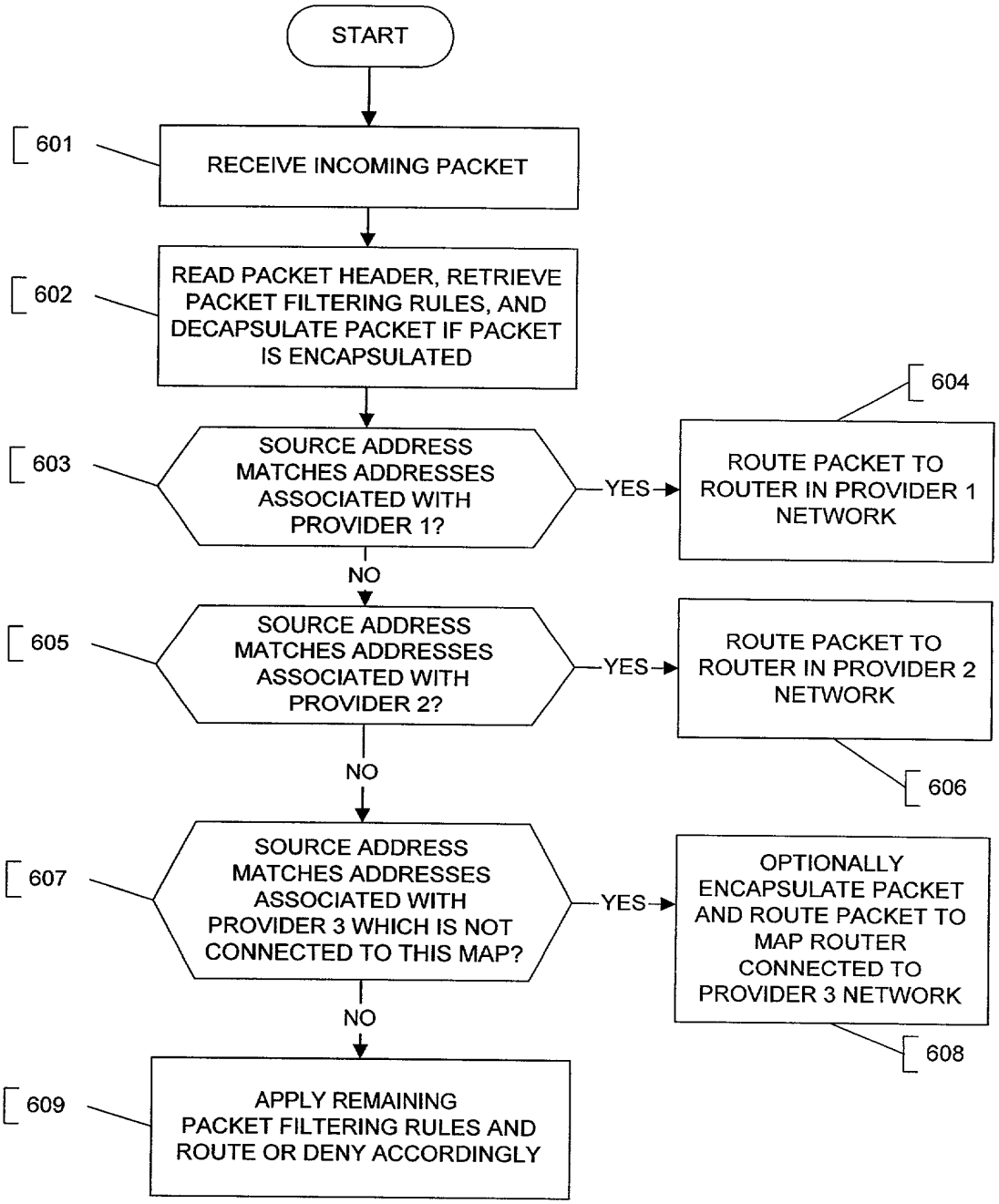
START
601
RECEIVE INCOMING PACKET
602
READ PACKET HEADER, RETRIEVE PACKET FILTERING RULES, AND DECAPSULATE PACKET IF PACKET IS ENCAPSULATED
603
SOURCE ADDRESS MATCHES ADDRESSES ASSOCIATED WITH PROVIDER 1?
YES
604
ROUTE PACKET TO ROUTER IN PROVIDER 1 NETWORK
NO
605
SOURCE ADDRESS MATCHES ADDRESSES ASSOCIATED WITH PROVIDER 2?
YES
ROUTE PACKET TO ROUTER IN PROVIDER 2 NETWORK
606
NO
607
SOURCE ADDRESS MATCHES ADDRESSES ASSOCIATED WITH PROVIDER 3 WHICH IS NOT CONNECTED TO THIS MAP?
YES
OPTIONALLY ENCAPSULATE PACKET AND ROUTE PACKET TO MAP ROUTER CONNECTED TO PROVIDER 3 NETWORK
608
NO
609
APPLY REMAINING PACKET FILTERING RULES AND ROUTE OR DENY ACCORDINGLY

FIG. 6

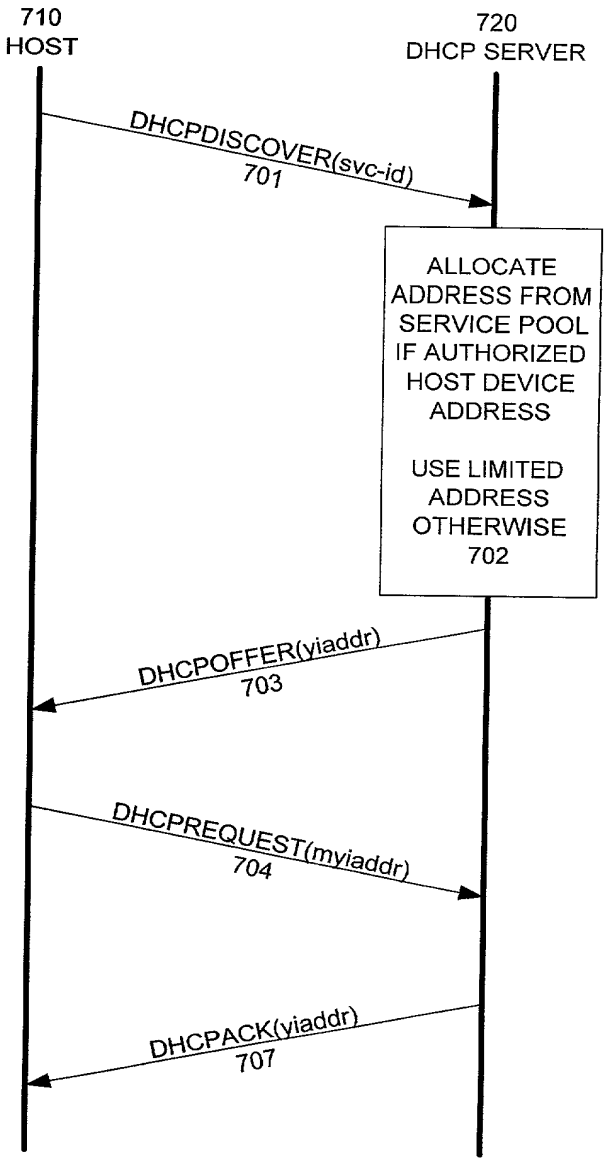
710
HOST
720
DHCP SERVER
DHCPDISCOVER(svc-id)
701
ALLOCATE ADDRESS FROM SERVICE POOL IF AUTHORIZED HOST DEVICE ADDRESS
USE LIMITED ADDRESS OTHERWISE
702
DHCPOFFER(yiaddr)
703
DHCPREQUEST(myiaddr)
704
DHCPACK(yiaddr)
707

FIG. 7

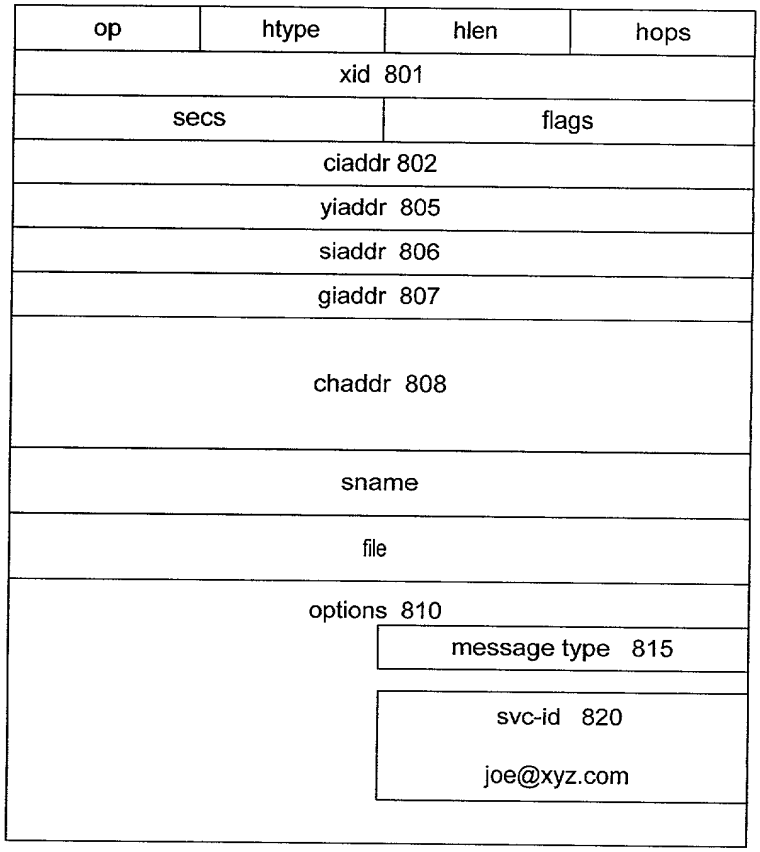
op
htype
hlen
hops
xid 801
secs
flags
ciaddr 802
yiaddr 805
siaddr 806
giaddr 807
chaddr 808
sname
file
options 810
message type 815
svc-id 820
joe@xyz.com

FIG. 8

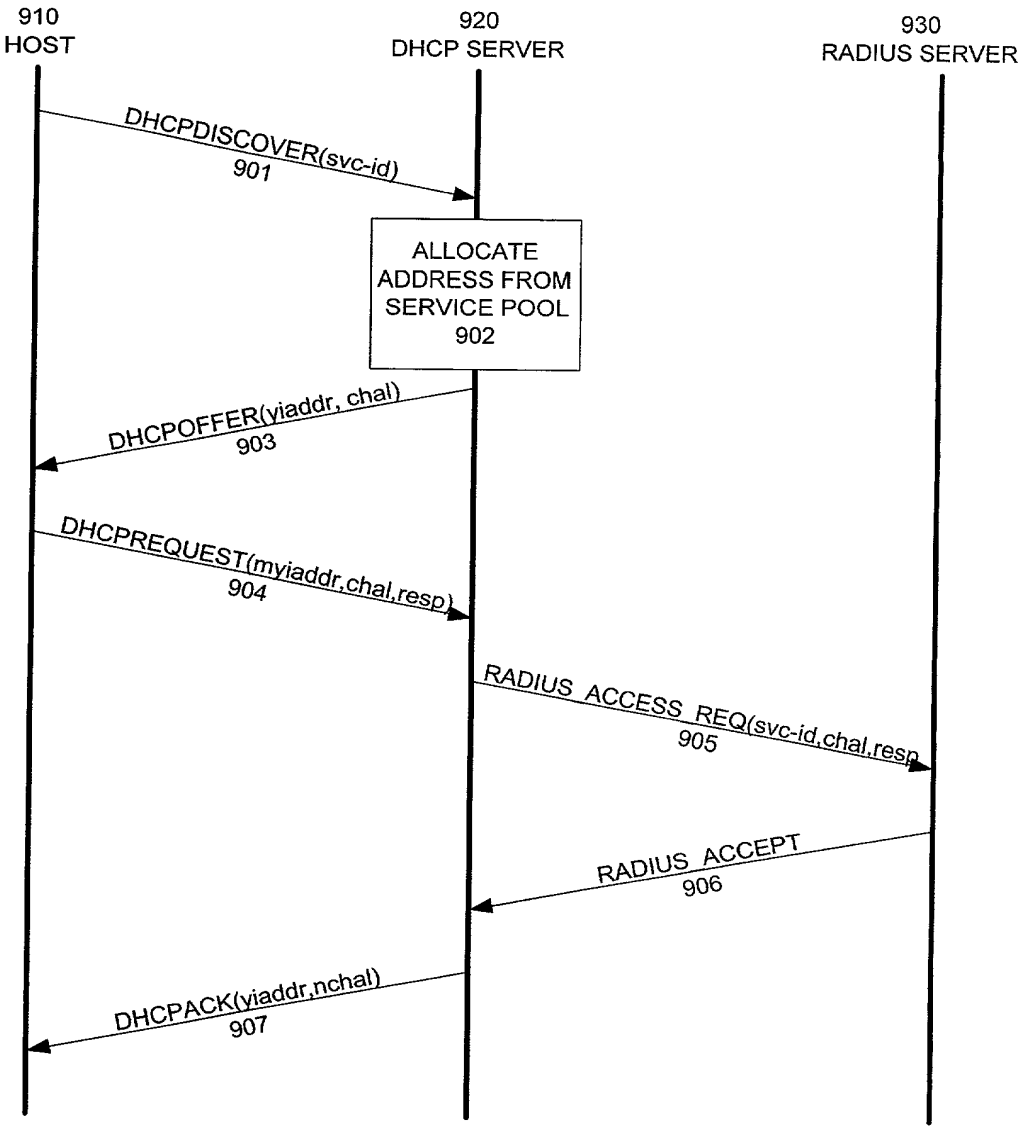
910
HOST
920
DHCP SERVER
930
RADIUS SERVER
DHCPDISCOVER(svc-id)
901
ALLOCATE
ADDRESS FROM
SERVICE POOL
902
DHCPOFFER(yiaddr, chal)
903
DHCPREQUEST(myiaddr,chal,resp)
904
RADIUS_ACCESS_REQ(svc-id,chal,resp
905
RADIUS_ACCEPT
906
DHCPACK(yiaddr,nchal)
907

FIG. 9

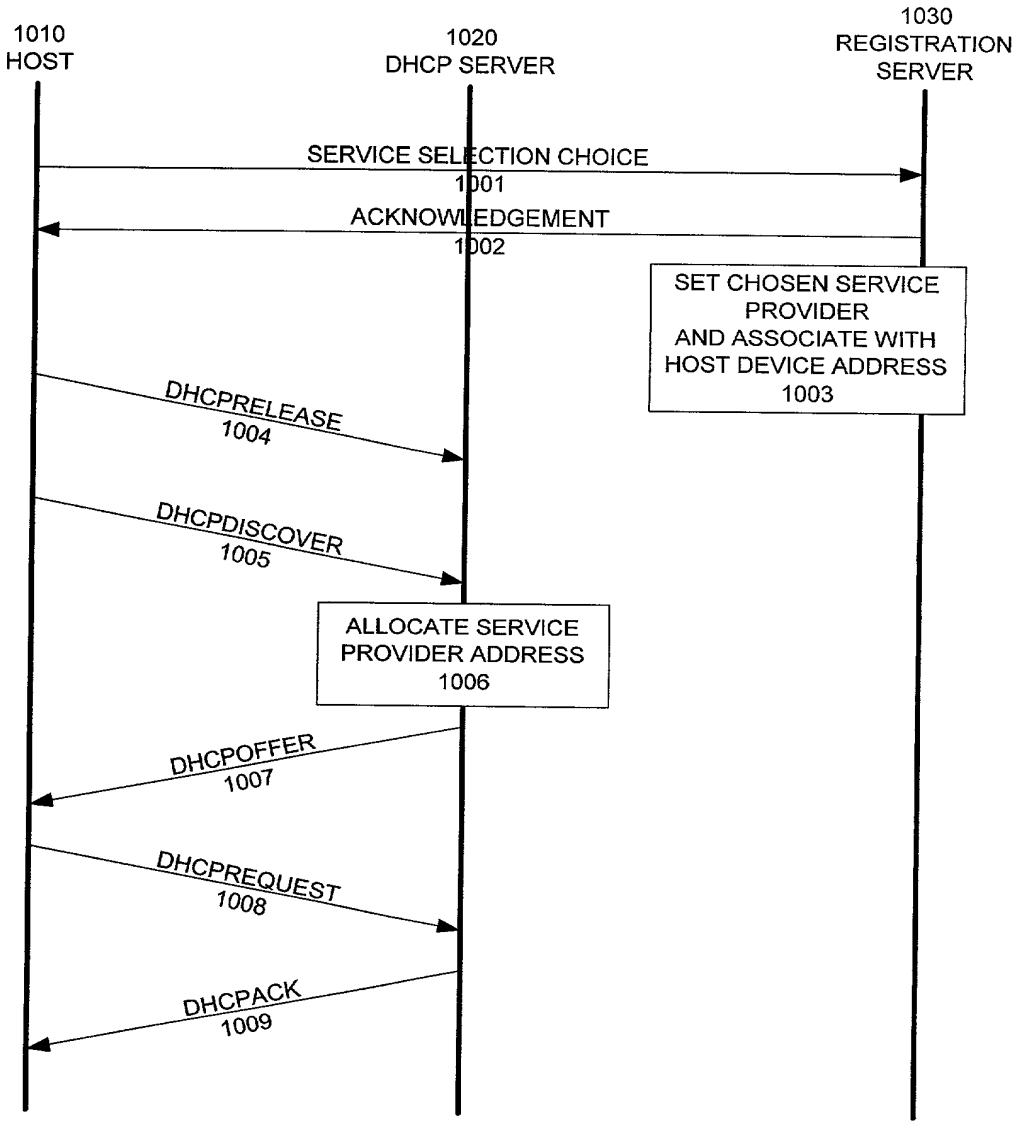
1010
HOST
1020
DHCP SERVER
1030
REGISTRATION
SERVER
SERVICE SELECTION CHOICE
1001
ACKNOWLEDGEMENT
1002
SET CHOSEN SERVICE
PROVIDER
AND ASSOCIATE WITH
HOST DEVICE ADDRESS
1003
DHCPRELEASE
1004
DHCPDISCOVER
1005
ALLOCATE SERVICE
PROVIDER ADDRESS
1006
DHCPOFFER
1007
DHCPREQUEST
1008
DHCPACK
1009

FIG. 10

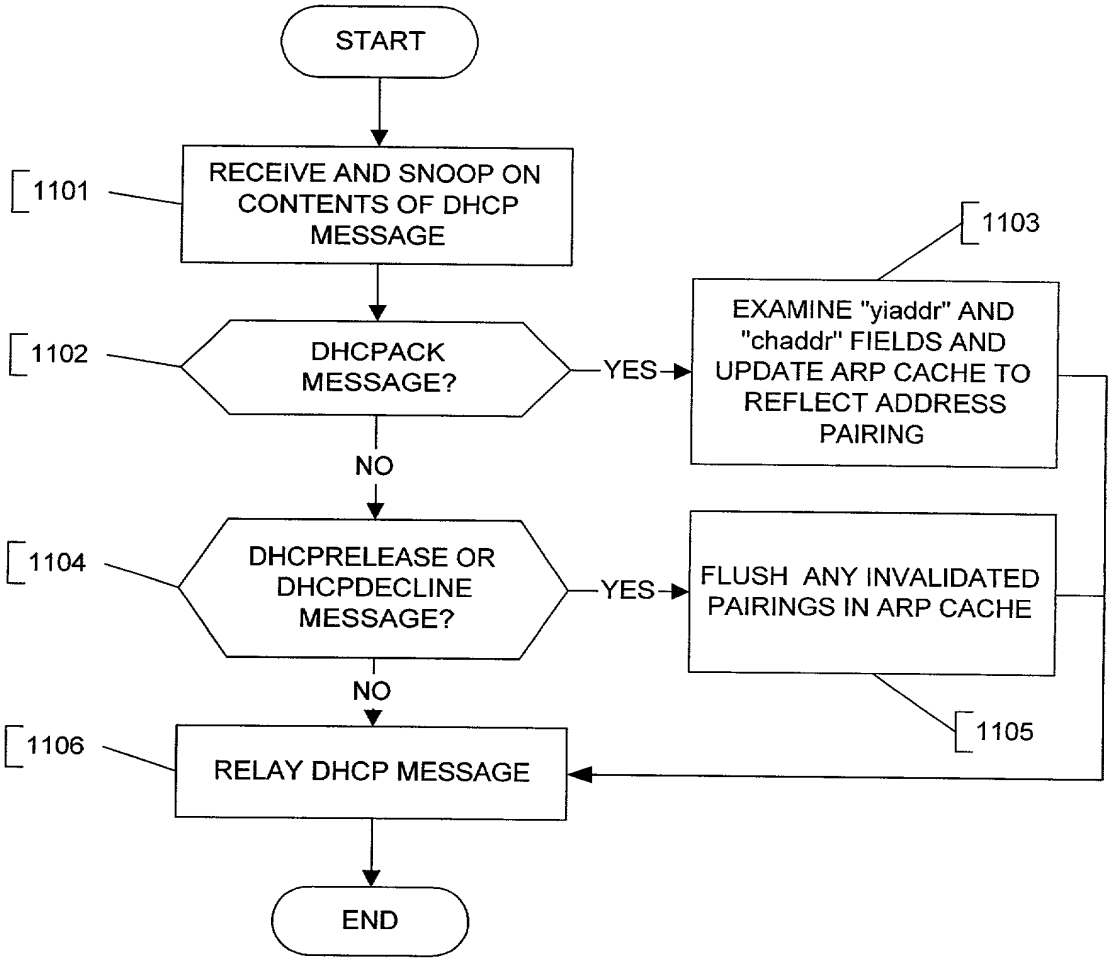
START
RECEIVE AND SNOOP ON CONTENTS OF DHCP MESSAGE
1101
DHCPACK MESSAGE?
1102
YES
EXAMINE "yiaddr" AND "chaddr" FIELDS AND UPDATE ARP CACHE TO REFLECT ADDRESS PAIRING
1103
NO
DHCPRELEASE OR DHCPDECLINE MESSAGE?
1104
YES
FLUSH ANY INVALIDATED PAIRINGS IN ARP CACHE
1105
NO
RELAY DHCP MESSAGE
1106
END

FIG. 11

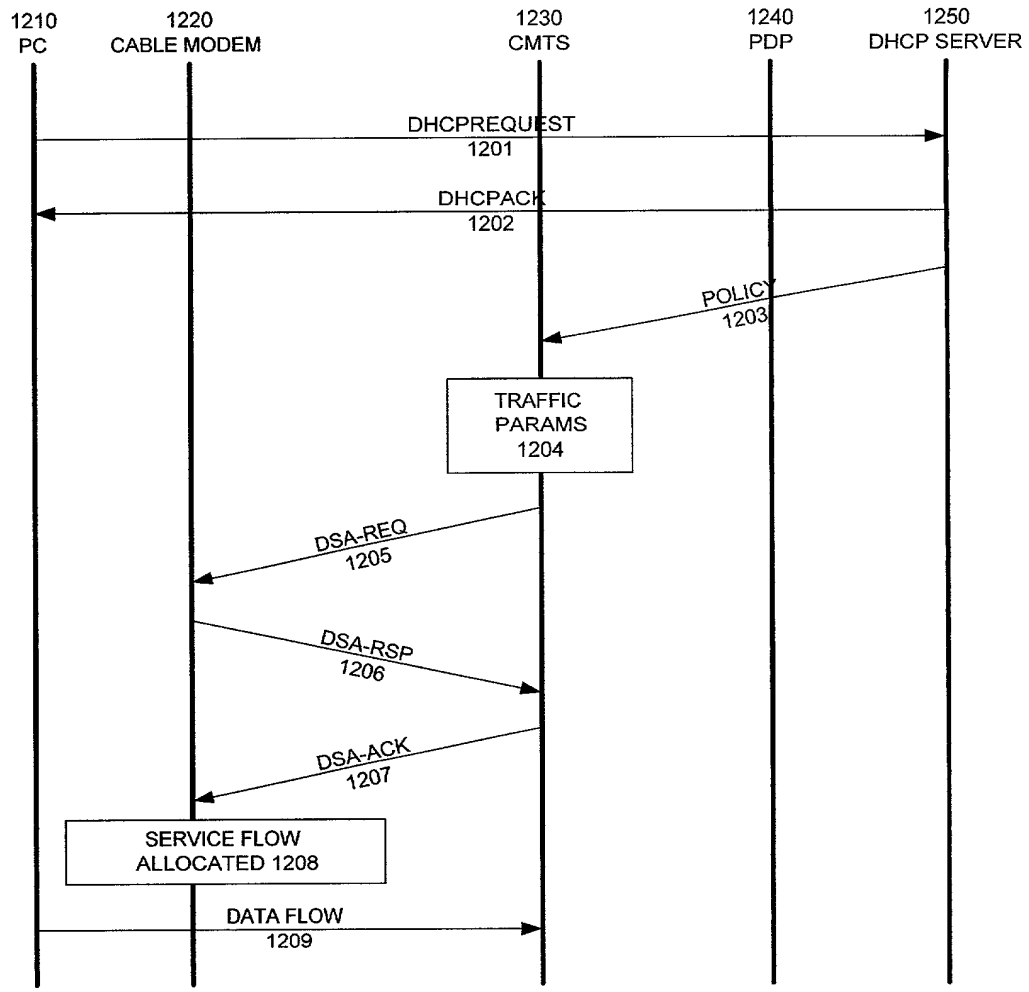
1210
PC
1220
CABLE MODEM
1230
CMTS
1240
PDP
1250
DHCP SERVER
DHCPREQUEST
1201
DHCPACK
1202
POLICY
1203
TRAFFIC
PARAMS
1204
DSA-REQ
1205
DSA-RSP
1206
DSA-ACK
1207
SERVICE FLOW
ALLOCATED 1208
DATA FLOW
1209

FIG. 12

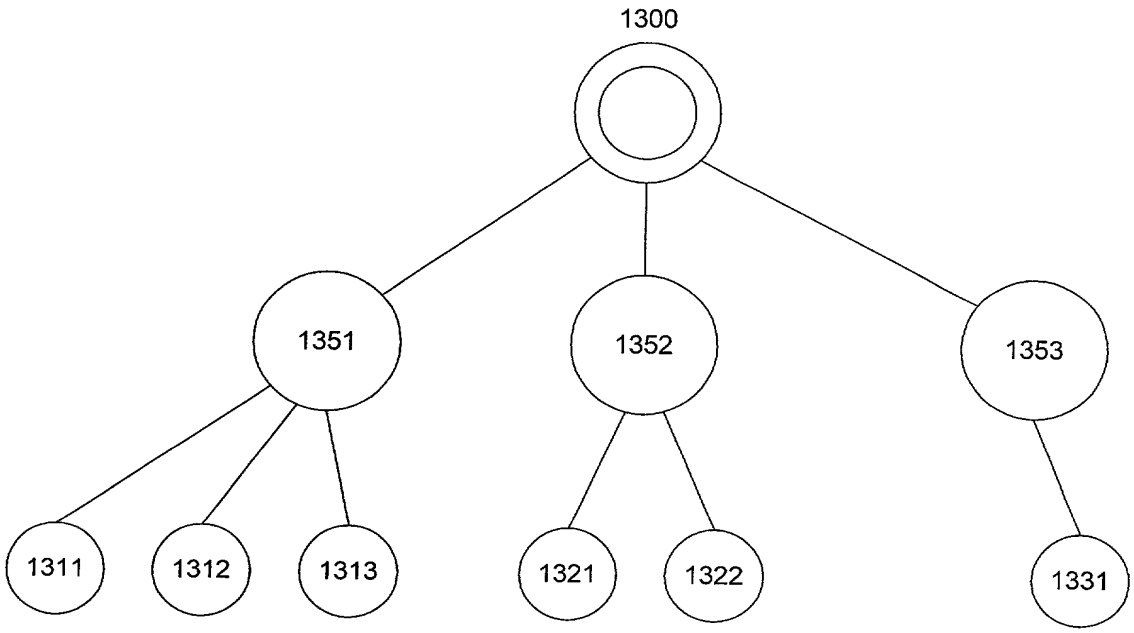

FIG. 13